

Question 6:

Overall, where were the greatest environmental and health impacts?

CRTs have greater life-cycle impacts than LCDs in most impact categories. The results of the LCIA show that the CRT has greater total life-cycle impacts than the LCD in 18 of the 20 impact categories. The LCD has greater impacts in only two categories: eutrophication and aquatic toxicity. Note, however, that these results do not indicate the magnitude of the impact itself or the magnitude of the difference between impacts for the CRT and LCD. Additionally, in the ozone depletion category, the analysis included substances that were phased out of production by 1996 by the countries that were signatories to the Montreal Protocol. When phased-out substances are removed from the inventories, the results for the ozone depletion category are reversed, with the LCD having the greatest impacts.

Manufacturing is the life-cycle stage with the greatest impacts. When considering which life-cycle stage has greater impacts, the LCIA results showed that the manufacturing life-cycle stage dominates impacts for most impact categories for both the CRT and LCD. Table 6.1 summarizes which life-cycle stages have the greatest impacts for each impact category. As shown in the table, nine out of the 20 impact categories showed the greatest impacts during the manufacturing stage for the CRT, and 11 of the 20 categories showed the greatest impacts during the manufacturing stage for the LCD. Impacts were greatest from the use stage for six of the 20 categories for the CRT, and for four of the 20 categories for the LCD. Impacts were greatest from the upstream life-cycle stage (i.e., raw material extraction plus materials processing) in three categories for both the CRT and LCD. Impacts were greatest from the end-of-life stage for the same two impact categories (hazardous waste landfill use and radioactive waste landfill use) for both the CRT and LCD.

Energy generation and use in the CRT life-cycle is the largest contributor in almost all impact categories. The largest contributor in 18 of the 20 impact categories for CRTs is related to energy generation and use. Energy use in glass manufacturing and associated production of LPG drive the CRT results in ten impact categories, including overall life-cycle energy use. The generation of electricity for the use stage dominates seven impact categories. The only categories in which energy is not a major contributor are hazardous waste landfill use (where landfilled CRTs have the greatest impact) and aquatic ecotoxicity (where phosphorous used in CRT manufacturing is the largest contributor).

More information is needed on energy used in CRT glass manufacturing. The large amount of LPG reported for glass manufacturing was originally questioned during the data collection and verification stage of this project. A sensitivity analysis was conducted where the glass energy data were modified. The overall energy required to produce a kilogram of CRT glass in the original analysis was nearly 100 times greater than that in the modified scenario. As a result, the

CRT modified glass energy scenario had greater energy use impacts in the use stage than in the manufacturing stage. It is likely that the actual energy inputs are somewhere between the baseline and modified glass scenarios, but additional information is needed to verify this assumption.

Energy use and generation also impacted many categories in the LCD life-cycle. Impact results for LCDs were less sensitive than those for CRTs to an individual input or output, although energy still played a prominent role. The most significant contributor in 12 of the 20 impact categories was energy related.

Table 6.1. Life-cycle stage with greatest impact for each display, by impact category

Impact category	Life-cycle stage with greatest impacts			
	Upstream	Manufacturing	Use	EOL
Renewable resource use	LCD	CRT		
Nonrenewable resource use		CRT, LCD		
Energy use		CRT, LCD		
Solid waste landfill use			CRT, LCD	
Hazardous waste landfill use				CRT, LCD
Radioactive waste landfill use				CRT, LCD
Global warming		LCD	CRT	
Ozone depletion		LCD	CRT	
Photochemical smog	LCD	CRT		
Acidification			CRT, LCD	
Air particulates			CRT, LCD	
Water eutrophication	CRT	LCD		
Water quality, BOD		CRT, LCD		
Water quality, TSS		CRT, LCD		
Radioactivity	CRT, LCD			
Chronic health effects, occupational		CRT, LCD		
Chronic health effects, public			CRT, LCD	
Aesthetics (odor)		CRT, LCD		
Aquatic toxicity	CRT	LCD		
Terrestrial toxicity		CRT, LCD		
TOTALS	CRT=3 LCD=3	CRT=9 LCD=11	CRT=6 LCD=4	CRT=2 LCD=2